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1 WINDOW WIPER, IN PARTICULAR FLAT BEAM WINDOW WIPER
2 FOR VEHICLES

5 Related Art

7 The invention is based on a window wiper, in particular flat beam window wiper
8 for vehicles, of the class defined in the preamble of Claim 1.

10 So-called flat beam window wipers are made known, for instance, in US 3 192
11 551. In them, a single spring strip back, on the middle connecting device of which
12 the wiper arm of the window wiper grips, creates a constant pressure of the
13 rubber wiper strip fastened to the back against the usually curved surface of the
14 front window or windshield of the vehicle across the entire wiping range. To this
15 end, the bent spring strip back has a material strength that changes along its
16 length, is at a maximum in the middle of the back and decreases toward both
17 ends of the back.

19 Advantages of the Invention

21 The window wiper according to the invention having the features of Claim 1 has
22 the advantage that, as a result of the quasi constant course of hardness along
23 the length of the spring strip back, the latter can be bent evenly and equally well
24 in all sections, and an optimal course of the pressing force acting on the wiper
25 strip can therefor be set for front vehicle windows having different curvatures.

27 Advantageous further developments and improvements of the window wiper
28 indicated in Claim 1 are possible using the measures listed in the further claims.

30 According to a preferred embodiment of the invention, the spring strip back is
31 heated to the required hardening temperature in a continuous operation, then

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1 quenched and, to temper it, heated to a tempering temperature in such a way
2 that it does not reach the tempering temperature until immediately before leaving
3 the tempering zone. In this fashion, the largely constant course of strength is
4 achieved reliably and reproducibly in the continuous operation. Due to the fact that
5 the tempering temperature is not reached until "as late as possible", the dwell
6 time of the spring strip material at the tempering temperature is extremely low
7 and the final hardness of the spring strip back is determined solely by the
8 tempering temperature, while the dwell time does not influence the final
9 hardness.

10
11 In order to realize the aforementioned requirement of an extremely short dwell
12 time of the spring strip material at the tempering temperature in a simple fashion,
13 the tempering zone for the spring strip back is divided into multiple temperature
14 zones, and the spring strip back is moved through the temperature zones in such
15 a way that it passes through the temperature zone last that brings about the
16 tempering temperature. As a result of the prewarming of the spring strip back
17 achieved in this fashion to temperatures below the actual tempering temperature,
18 the spring strip material is already heated in such a way that, in the last
19 temperature zone, the tempering temperature is achieved nearly equally quickly
20 in the thick as well as the thin sections of the spring strip back and, therefore, the
21 dwell time at the tempering temperature is approximately the same for all strip
22 sections.

23
24 According to a preferred embodiment of the invention, this rapid heating of the
25 spring strip back to the tempering temperature in the last temperature zone is
26 achieved using thermal radiation and a short pathway of action for this thermal
27 radiation upon the spring strip back. In this process, a good thermal isolation of
28 the last temperature zone from the preceding temperature zone is an advantage.
29

Drawing

The invention is explained in greater detail in the description below using a design example shown in the drawing.

Figure 1 shows a side view of a flat beam window wiper.

Figure 2 shows a side view of a spring strip back of the flat beam window wiper in Figure 1 prepared for its refinement.

Figure 3 shows a diagram of the course of thickness and hardness along the length of a spring strip back refined using traditional means.

Figure 4 shows a similar diagram of the course of thickness and hardness along the length of the spring strip back refined according to the invention.

Figure 5 shows a similar illustration as in Figure 4 of a spring strip back refined according to the invention with a higher hardness specification.

Description of the Design Example

The flat beam window wiper shown in a side view in Figure 1 as a design example for a window wiper for motor vehicles has a curved spring strip back 10 that has a connecting device 11 in the middle for a wiper arm 12 indicated in

Figure 1 using a dash-dotted line and which is combined with a rubber-elastic wiper strip 13. The spring strip back 10 is curved using a rolling and bending procedure, for instance, and has a variable strip thickness or material strength d along the length of the back 1, as illustrated in Figure 2. The strip thickness d is greatest in the middle of the spring strip back 10 and decreases continuously toward both ends of the spring strip back 10. The rubber-elastic wiper strip 13 can be applied in such a fashion that the spring strip back 10 is pressed in a level

1 position, and the wiper strip 13 is adhered or vulcanized to the concave side in
2 the unloaded state. In the operating state, the window wiper lies with the wiper
3 strip 13 under a certain pressing force against the front window or windshield of
4 the vehicle indicated by number 14 in Figure 1 and is set into a swivel motion by
5 the wiper arm 12 in a known fashion by a wiper drive, so that the wiper edge 131
6 of the wiper strip 13 is moved across the window.

7
8 The spring strip back 10 is refined and, despite its varying strip thickness d along
9 the length of the back l , exhibits a nearly constant course of strength or hardness
10 (H) along the length of the strip l . In order to reproducibly ensure this quasi
11 constant course of hardness using production engineering, the spring strip back
12 10 is refined (hardened and tempered) in a continuous operation in such a
13 fashion that it is heated to a required hardening temperature, then quenched and,
14 to temper it, heated to a tempering temperature in such a way that it does not
15 reach the tempering temperature until immediately before it leaves the tempering
16 zone. In order to make the continuous operation possible, a plurality of spring
17 strip backs 10 are combined in one spring strip 15, as shown in sections in a side
18 view in Figure 2. After refinement, the spring strip 15 is cut through at the
19 separating points 16, so that the refined spring strip backs 10 are available
20 individually.

21
22 While the hardening of the spring strip 15 takes place in known fashion, when the
23 spring strip 15 is tempered, each spring strip back 10 is heated while the spring
24 strip 15 passes through the tempering zone in such a way that its strip material
25 reaches the tempering temperature as late as possible, i.e., not until immediately
26 before leaving the tempering zone. The dwell time of the strip material at the
27 tempering temperature is therefore extremely short, so that the dwell time cannot
28 affect the hardening result, and the final hardness of the spring strip back 10 is
29 determined solely by the tempering temperature. In order to realize this reaching
30 of the tempering temperature "as late as possible", the tempering zone is divided
31 into multiple temperature zones, and the spring strip 15 is moved through the

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temperature zone in such a way that each spring strip back 10 passes through the temperature zone last that brings about the tempering temperature. In this process, the length of the last temperature zone is coordinated with the pass-through speed of the spring strip back 10 in such a way that the tempering temperature is reached immediately before the spring strip back 10 leaves this temperature zone. To accomplish this, the spring strip back 10 is prewarmed in the last temperature zone using thermal radiation and heated to a temperature below the tempering temperature in the preceding temperature zones, so that the heating to tempering temperature is achieved very quickly using thermal radiation in the preferably thermally isolated, final heating zone.

The diagrams in Figures 3 and 4 show the result of refinement of a spring strip back 10 refined according to the invention as compared to a spring strip back 10 refined using a traditional method. Each of the curves 1 represents the course of thickness of the spring strip back 10 along the length of the back. The curves 2 show the course of strength or hardness (H values) along the length of the back. It is clear to see that, in Figure 3, the hardness values fluctuate with the strip thickness, and the sections with lower strip thickness have lower H values than the sections with greater strip thickness; in contrast, the course of H values along the length of the back in Figure 4 is roughly constant and, therefore, the thinner strip sections have approximately the same H values as the thicker strip sections.

In the cases shown in Figures 3 and 4, the spring strip back 10 was exposed to approximately the same hardening temperature. The tempering temperature in the case shown in Figure 3 was constant and lay at a higher temperature level than in the case shown in Figure 4. The tempering temperature in the case shown in Figure 4, in the temperature zones preceding the last temperature zone, was lower than the required tempering temperature.

The only difference between the diagram shown in Figure 5 and the diagram shown in Figure 4 is that a higher hardening specification was targeted for the

1 spring strip back 10. The hardening temperature for the spring strip back
2 according to Figure 5 was dimensioned to the same extent as in the case shown
3 in Figure 4 and was constant. The tempering temperature was reduced
4 considerably, and the temperature difference between the preceding temperature
5 zones and the tempering temperature caused in the last temperature zone was
6 reduced.

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